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CACAO

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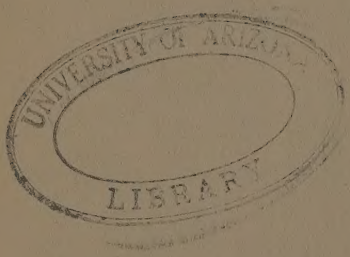
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THE FLOWERING AND FRUITING STEM OF THE CACAO TREE.

FIELD MUSEUM OF NATURAL HISTORY
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LEAFLET NUMBER 4

Cacao

Long before the discovery of the American continent, cacao was used and cultivated from Mexico to Ecuador. It is thus a distinctly American contribution to the world's food resources.

It is the product of some small trees indigenous to the shady forests of northern South America. It probably also grew native along the Gulf Coast as far north as southern Mexico. The original extent of distribution of a plant so useful as the Cacao tree is difficult to determine with exactness. Its use has no doubt spread from one native tribe to another over a large area suitable for its cultivation. Besides, in the region in question, there has apparently been a shifting of peoples or a change of territories occupied by them in prehistoric days. It is even possible that the cultivation of the cacao was carried northward into Mexico from the south. There, at any rate, it was used by the Aztecs, and before them by the Toltecs. The early Conquistadores made its acquaintance at the court of Montezuma and the revenues of this renowned monarch consisted in part of cacao beans. "Chocolatl" was served to the king in a golden goblet, and he took it with the aid of a tortoise-shell spoon. His fondness for it must have been prodigious for fifty pitchers are said to have been prepared daily for his personal consumption, and two thousand more for his court.[1]

[1]Prescott, Bk. IV, Ch. I.

The readiest source of information about the Aztec use of cacao is of course, Prescott's "Conquest of Mexico." In a note there[2] we read in this connection: "Torquemada has extracted particulars of the yearly expenditure of the palace from the royal account book, which came into the historian's possession. The following are some of the items: 4,900,300 fanegas of maize (the *fanega* is equal to about 100 pounds); 2,744,000 fanegas of cacao; 8,000 turkeys, 1,300 baskets of salt; besides an incredible quantity of game of every kind, vegetables, condiments, etc." A cacao consumption, according to this, almost equal to the world's entire production today!

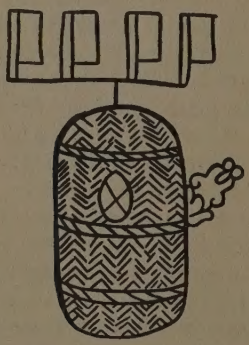

Fig. 1. Aztec glyph or pictograph for 80 bales of cacao. Each pennant stands for 20. The oval figure on the bale is the sign for cacao beans. The pictographer must have wanted to make the meaning unmistakable, or he desired to exercise his artistic skill, for to the usual glyph he has added a flower growing out of one side of the bale, as from the trunk of a cacao tree. (The Book of Tributes).

In the Book of Tributes[3], an old Mexican codex, setting forth the "Tributes which some towns of Mexico paid to the Emperor Montezuma," there are speci-

[2]Prescott, Bk. I, Ch. VI, note 29.

[3]Libro de Tributos, in collection Lorenzo Boturino. Antonio Peñafiel: Monumentos del Arte Mexicano Antiguo. Berlin 1890.

Fig. 2. Aztec glyph for 20 baskets heaped with cacao beans to the extent of four xiquipilli each. (The Book of Tributes).

fied in Aztec glyphs the kind and number of articles annually required by him from his provinces. The lists include arms, apparel, skins, feathers, shells, balsams, resins, perfumes, maize, peppers, etc. Cacao beans are mentioned several times, e. g., from Cihuatlan 80 bales of red cacao, from Tlaltelolco 20 baskets containing four *xiquipilli* (4x8000) of cacao beans. The district of Soconusco must have been famous even then for its cacao, for two hundred bales were required from there, together with 400 cups for drinking chocolate. On the basis of the information in this ancient document, the revenues of Montezuma

Fig. 3. Aztec glyph for 400 chocolate cups. (The Book of Tributes).

have been estimated. His yearly quantum of cacao seems to have been about a thousand porters' loads, equivalent to perhaps 100,000 pounds, with chocolate cups to the number of 1600.

As to the ancient manner of preparation of the favorite beverage, Prescott[4] states, "They had a way of preparing the froth of it, so as to make it almost solid enough to be eaten." And again in a footnote where he quotes "Anonymous Conqueror": ' "The froth delicately flavored with spices and some other ingredients was taken cold by itself. It had the consistency almost of a solid," and the writer is very careful to inculcate the importance of "opening the mouth wide, in order to facilitate deglutition, that the foam may dissolve gradually, and descend imperceptibly, as it were, into the stomach." '

The Franciscan monk Ximenes, who published an abstract of Hernandez' manuscript on Mexican natural products before the appearance of that work, is authority for the following account[5]: "She who sells prepared cacao grinds it first in this way, breaks or pounds the kernels; the second time grinds it more; the third or last time grinds it still finer, mixing it with grains of corn, cooked and washed, and this being done adds a little water in a jar. If a small quantity is added it makes a rich cacao, if too much no foam results and in order to produce the very best it is made and preserved as follows: namely it is strained, and after straining it is lifted in order to drain, foam is formed and is set aside and the remainder sometimes becomes very thick, and water is added after grinding. The one who knows how to make it well, sells it good and fine, that only the *Señores* drink it; it is soft, foamy brown red and pure, without much paste. Sometimes

[4]Book I, Ch. V, note 45.

[5]Cecilio A. Robelo: Diccionario de Aztequismos, etc. Cuernavaca, 1904.

they add aromatic spices and even honey from bees, and some rose water, but the cacao that is not good has much sediment and water and does not make any foam but only froth."

A similar account of the preparation of the cacao in ancient Mexico is given by Joyce[6] as follows: "The beans were first roasted in pans of pottery and then ground on stones with a little water. The resultant paste was put into calabash cups, more water added, and occasionally a little spice."

Or, in another[7] manner: "The nut was pounded and boiled in water with a little maize flour, the oil was skimmed off and the mixture strained and poured into another vessel, so as to produce a froth. Sometimes honey and vanilla were added, and it was generally taken after food." Such a dish of cacao and maize flour constitutes many a Mexican breakfast today. The Chorotegas colored the drink red with Anatto seed. Among the Nicaraguans such a drink, prepared with cold water, sugar and spice, is known as "tiste." It is beaten to a froth with a swizzle stick held vertically between the palms of the hands and rapidly rotated with a backward and forward motion. The swizzle stick functions as a primitive and somewhat inefficient egg-beater. It is often cut from a natural branch, forked or with a whorl of small twigs as spokes. It is even now a famous household utensil in the Caribbean region, and is employed in the mixing of cooling drinks. Since its adoption by the white population, however, a devotion to the swizzle stick no longer necessarily implies an addiction to foaming chocolate. The Mexican term, "chocolatl," from which our word "chocolate" is derived, actually means a foaming drink, "choco" = "foam," "atl" = "water"

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[6]Thomas A. Joyce, Mexican Archeology, p. 155.
[7]Joyce, Central American and West Indian Archeology, p. 39.

or "drink." The Cacao tree was called *Cacaoquahuitl* or *Cacahuatl.*

The beans were used as small currency in old Mexico. The unit was a score, 20 beans; 20 x 20 or 400 made a *Tzontle;* twenty (20) Tzontles or 8000 cacaos one *Xiquipilli,* and 3 Xiquipillis a load. Weights formerly did not exist there and large quantities were measured in baskets or bags assumed to hold a specified number, just as farmers today by preference estimate their produce by counting and measuring in bushels and pecks, rather than by weighing. On the Mosquito Coast the habit of using cacao beans as money is said to be prevalent among the Indians even at the present time, as is the use of coca leaves for the same purpose in Peru, and tobacco in many places. It was of this use of the beans that Peter Martyr[8] exclaimed, *"O felicem monetam",* etc., "blessed money, which exempts its possessor from avarice, since it cannot be long hoarded nor hidden under ground." However, there was a complaint in Mexico that the Indians would remove the kernels and fill the empty shells with clay.

Cacao was introduced into Europe early in the 16th century, at first into Spain. There it was for a time the monopoly of the Conquistadores, but interest in the new beverage must have been considerable, for "it was also prepared secretly, and was taken with wine and hot beer."[9] Outside of Spain it remained completely unknown, so long that a ship-load of cacao beans, seized by the English in 1579, was burned as worthless. A Florentine, long resident in the West Indies, made known its manner of preparation in Italy and its use gradually spread on the continent, though not

[8]Peter Martyr, De Orbe Novo, dec. 5, cap. 4.
Prescott, Hist. Mexico, Bk. I, Ch. V, note 27; Bk. IV, Ch. II, p. 140.

[9]Warburg Planzenwelt, VII, p. 425.

without opposition. Its introduction into Prussia was prohibited by Frederic the Great. The Parisian physician Bachot, however, in a thesis to the faculty of medicine, praised the cacao as one of the most noble of discoveries, far more worthy to be the food of the gods than are nectar and ambrosia.

When Linnaeus sat down to straighten out the confusion of terminology existing in the herbals, and to confer unmistakable and distinctive names on all the animals and plants of which he could learn and could muster a definite description, he coined a name for the chocolate tree, from two Greek words, (θεός) theos, god and (βρῶμα) broma, food—*Theobroma*, "food for the gods". This remains the scientific name for Cacao trees in general.

The particular kind or species of Cacao trees which furnishes the beans of commerce was designated as *Theobroma Cacao*. Other species of *Theobroma* also furnish nourishing food or drink to a lesser extent but are less valuable or less amenable to cultivation. There are about a dozen of these. The best known of them is the Tiger Cacao, or "Pataste", *Theobroma bicolor*, of Colombia and Rio Negro, a much larger and taller tree than the Cacao tree proper. The famous cacao of Soconusco is said to be the product of *Theobroma angustifolia*, and the cacao of Esmeralda of still another species. The beans of an inferior kind were used in Mexico as alms for the poor. The rest, all natives of tropical America, are of some local importance and the fruit of several is gathered in Brazil where they grow wild. Some of them may be adaptable for stock or for grafting, as recent experiments would indicate.

The cultivated Cacao is a small shade-loving tree, which is usually kept down in plantations to about the size of a peach tree, but grows much more rapidly and bears large simple leaves which remain a long

time on the tree. It produces its flowers and fruits in a curious manner peculiar to certain members of the tropical forest flora. The smaller branches and terminal twigs support the foliage only, while the inconspicuous yellow and purple flowers spring in clusters from points on the bark of the trunk and of the larger branches. It has been suggested in explanation, that this arrangement facilitates the finding of the flowers by low-flying insects that visit and pollinate them. They do not have to search for the small blossoms among a crowded mass of foliage on top, but can find them readily on the bare trunk near the forest floor. However that may be, the fruiting tree presents a striking appearance. While very young, the fruits look like miniature green cucumbers sharply pointed at both ends; as they enlarge and mature, they become great "pods", five to seven, or even ten inches long, with longitudinal grooves alternating with ribs on the surface. They acquire a texture recalling that of a thin-skinned squash, and a color varying from a lemon or ochre yellow to a deep red. Hanging singly or in small bunches around the slim trunk of the tree, they scarcely look as if they had grown, but rather as if they had been accidentally or purposely hung there. The pods are picked when ripe and gathered into piles. The workers on the plantation then sit down to break the outer casing which is of no further value, in order to secure the contained seeds, the cacao beans, which furnish the chocolate. In a well-filled pod there may be fifty of these, usually there are not so many, all attached to a central core and covered with a white, slippery and soft, mucilaginous pulp, of a pleasant acid taste. This layer is removed or is completely destroyed in the process of sweating or fermentation to which the beans are subjected for some days before they are dried for the market. For this purpose they are piled into heaps which are turned occasionally. The fer-

mentation is thought to be initiated by a yeast fungus, and an enzyme is said to bring out the characteristic chocolate flavor of the beans. Their kernels, originally white to purple in color, assume a brownish hue, while the papery thin shell often becomes discolored and spotted. The subsequent process of drying is necessary to prevent moulding and spoilage. To clean or polish the beans they are sometimes treaded with the naked feet, or "danced". In some localities they are colored with a red earth to improve their appearance. The dried "beans" will keep for a long time. A bearing tree in good condition, will yield a pound to two pounds of dried beans, usually in two principal harvests occurring about the beginning and middle of the year, though pods keep ripening to a certain extent continuously. The cacao bean "eats like a rich nut", but has a rather bitter taste.

It is perhaps well to point out here, that in spite of the similarity of names, cacao, or cocoa, has nothing to do either with the cocoa-nut, more properly spelled coco-nut, from the Coco-palm; nor with coca, the source of cocaine, obtained from the leaves of the Coca shrub of the Andean region.

As is the case among almost all cultivated plants there are many varieties of the Cacao tree proper, differing in minor particulars and in size and shape of the pods and in the color of the kernels. The best known of them are: the *Criollo,* which furnishes the finest chocolate; the *Forastero,* much resembling the former, but somewhat more hardy and yielding beans of not quite so fine a grade; the *Calabacillo,* with smooth pods, still easier to grow but yielding an inferior product. Of all of these, there are both red and yellow varieties.

The cacao beans are put in sacks and shipped to the manufacturers of chocolate products. In the factories they are first of all freed from the outer shell

by a slight crushing and winnowing. The kernels are known in the trade as "cacao nibs". They are roasted like coffee in iron cylinders to develop the aroma, to modify the bitter taste and to improve the color. They are then either ground directly, without any addition, into a dark-brown paste which we know in its moulded form as "bitter chocolate", or they are subjected to other treatment. Sugar or milk products and flavoring matter, principally vanilla or its substitutes, are added to increase the palatability, or starch to increase the bulk of the mass before it is pressed into moulds and made into convenient shapes and packages for the trade and for the consumer. The cacao shells contain some theobromine (1%) and are sometimes ground up and are known to the trade as "miserable", or "shells", sold as a poor substitute for cacao, "cacao coffee" or "cacao tea". They are seldom added to the chocolate mass, never to the better grades. Lately they have been employed as cattle fodder. If cacao powder is desired, the ground mass is usually heated slightly and subjected to pressure to express about one-half of the easily liquified fat, which is present in large quantity. This is then used separately as "cacao butter". It is a fixed oil, a soft solid at ordinary temperatures, with a pleasant odor and flavor of chocolate. At first yellowish in color, it becomes white with age. It has excellent keeping qualities and does not readily turn rancid. It is therefore valuable, being largely used in the manufacture of the filling for chocolate creams, and in the drug trade for the preparation of salves and pomades.

Cacao is never entirely soluble, but the drink when prepared is a suspension of cacao in the fine and thin paste of the natural starch of the bean. To make a smoother beverage the starch content may be increased somewhat in the manufacture of "breakfast cocoa". The sweetened cacao may have also all

of the natural fat, plus sugar. To make the so-called "soluble cocoa" or Dutch cocoa, a small quantity of an alkali is added, in which the tannin and theobromine are soluble.

The popularity of cacao is due to its combination of pleasant taste, and stimulating and nourishing properties. The latter depend partly on its fat content, but there is also naturally present in cacao beans starch and vegetable proteins. A drink of chocolate or cocoa, without any addition, is consequently much more nourishing than either coffee or tea, with which it is comparable in respect to stimulating properties. The stimulating substance, an alkaloid, is practically the same in the case of all of these, producing the same physiological effect. It is *caffein* in coffee, *thein* in tea, *theobromine* and *caffein* in cacao. In cacao the caffein[10] is present in less quantity than in either of the other beverages. There is also a volatile oil, as in coffee, to which must be attributed some of the exhilarating properties and flavor.

Hundreds of millions of pounds of cacao beans are now produced and consumed annually. In 1921, the United States imported three hundred million pounds,

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[10]Theobromine and caffein may be extracted and isolated as alkaloids and as such are white, fleecy, crystalline substances of a bitter taste. Medicinally they are used as stimulating drugs acting upon the nervous system by increasing the arterial tension and blood-pressure. They also stimulate the cerebral centers and respiration. The "nervousness" produced by their excessive use is due to continual stimulation of the nervous system and particularly of the spinal cord.
Theobromine and caffein are closely related. Chemically the former may be prepared from the latter.
Other stimulating drinks in which caffein is the active principle are: Kola, from the Kola "nut", the product of another tree of the Chocolate family, and *Guarana*, from a Brazilian bush (*Paulinia Cupana*) of which the seeds are ground up, and sold and used by the natives like cacao.
Of non-caffein containing substitutes for cacao, locally used in poor districts, may be mentioned the roasted and ground kernels of the pea-nut or ground-nut. In Mexico the name of the pea-nut is curiously enough "cacao of the ground" (*Cacahuate*).

valued at twenty-three million dollars. Most of the supply is still derived from northern South America, particularly from Ecuador and Brazil, from the West Indian San Domingo, and from the island of Trinidad off the delta of the Orinoco. Each of these countries furnishes over twenty thousand tons each year. Venezuela exports a little more than half as much; the Caribbean island Grenada about a quarter, or about five thousand tons a year. Cuba, Porto Rico, Haiti, Jamaica, and other West Indian islands produce smaller quantities, while Mexico evidently supplies only a negligible amount for export. In all, the American production amounts to over a hundred and fifty thousand tons. The rest of the world's output combined, adds only a third more to the available supply. The cultivation of the Cacao has been undertaken on the West Coast of Africa; on the Gold Coast, in Cameroons and in the Congo Free State, but by far the greater part of the African supply is furnished by Sao Thomé. This small Portuguese island in the Gulf of Guinea, alone yields more cacao beans than any single American country. In Asia, cacao growing has been tried, and Ceylon and the Dutch East Indies together sometimes yield as much as the island of Grenada; but on account of serious inroads of fungus diseases of the trees, Cacao has not been a success in this region, which otherwise is perfectly suitable, as to temperature, rainfall and freedom from drought, for the cultivation of the tree.

The African supply goes directly to Europe. It is not considered to be of a high grade. The American product is superior. That from a district in Guatemala, Soconusco, has the reputation of being the best of all, but like genuine Mocha coffee and the very finest of tea, it scarcely ever comes into the market. Of the export grades, the heavy beans from Ecuador and from western Venezuela, those from Colombia and

Esmeralda are the most highly esteemed. Trinidad cacao takes a high rank. Brazil and Cayenne ship the less desirable, unfermented grade of beans gathered partly from trees growing wild in the forest. The price has recently been low and the growing not very profitable to the planters. The trees require considerable care. As in the case of many tropical products a low price is dependent on very cheap labor, and the recent general increase of labor costs, without a corresponding rise in the price of the product of the plantations, has made production in places almost an impossibility. Unprofitable plantations are permitted to go to ruin. They continue to yield some cacao for a few years without care. When a dwindling of the supply eventually reacts on the price, active production will presumably be started again, till a commercial satiety is produced. New trees come into bearing in their fifth or sixth year. Cacao growing is evidently a somewhat risky business. Particularly is this true since the grower has to contend with a host of pests and diseases, chiefly caused by parasitic fungi which are extremely destructive to the trees where they obtain a hold.

In some cases these fungi have been traced to the taller trees which are planted among the Cacao trees for shade. Many kinds of shade trees have been tried, such as palms, the large-leaved Anchory Pear, and others, but the favorite one is the leguminous Madre de Cacao, "Mother of the Cocoa", the *Bois immortelle* of Trinidad. This is a rapidly growing deciduous tree which easily towers over the low chocolate trees, lending an interesting note of bright color and variety to the plantations, particularly in our winter season. These tall conspicuous trees then shed their leaves and are covered only with bright red flowers. At this time the rays of the sun are less intense, even in most of the tropical places where the Cacao grows in the

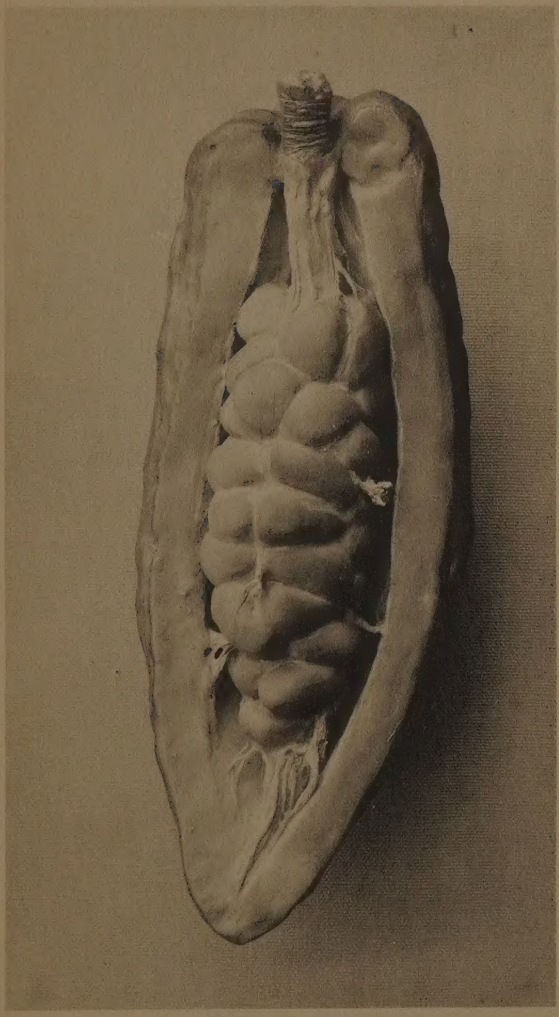
northern hemisphere, and the full amount of light not only does no harm, but may even be desirable. During the rest of the year, when shade is required, these shade trees are in foliage.

The rapidly increasing use of cacao, particularly in the form of sweets, bids fair to keep pace with production for some time to come.

B. E. DAHLGREN

In the Hall of Plant Life, Hall 29, on the second floor east, may be seen a reproduction of a Cacao tree bearing flowers and fruit, also an enlarged flower, a fruit in section, cacao "beans" and a pod of the Tiger Cacao.

The economic exhibit of Cacao is to be found among the vegetable food products on the south side of the adjoining Hall 25.



AN OPENED CACAO POD.

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